

82-12

The Dual Thermostat

One Temperature for
Day-Time

One Temperature for
Night-Time



Supplement
to
General Catalog

JOHNSON PNEUMATIC
SYSTEM OF TEMPERATURE
AND HUMIDITY CONTROL



AUG 14 '25

DUAL THERMOSTAT

NORMAL TEMPERATURE

ECONOMY TEMPERATURE

**JOHNSON
SYSTEM OF TEMPERATURE
AND HUMIDITY CONTROL**

JSC

JOHNSON SERVICE COMPANY

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MAIN OFFICE AND FACTORY:
MILWAUKEE, WISCONSIN

FOREWORD

The Johnson Service Company presents the Dual Thermostat, a new development, in this supplement to the General Catalogue on Temperature Regulation and Humidity Control.

The art and application of Temperature Regulation is constantly changing. There is always a demand for apparatus that will simplify the heat control system and add to its many advantages.

The Dual Thermostat increases the efficiency of the modern heating, ventilating and temperature regulation plant; it produces greater economy and prevents heat waste; it operates at two different temperatures without variation in sensitivity or accuracy.

JOHNSON SERVICE COMPANY

MAIN OFFICE AND FACTORY

MILWAUKEE, WISCONSIN

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This is a picture of an office building at night. The lighted windows indicate where people are working and heat is turned on by the Dual Thermostat, regulating at normal temperatures. The dark windows show the parts of the building that are vacant, where the Dual Thermostat is controlling at low temperatures and preventing heat waste.

History and Development

Johnson Dual or Two Temperature Thermostat

Necessity: During the past ten years it has been the main desire of many Engineers and Managers operating Heating Systems to secure a device which would enable them to cut off the heat in any part of a building from some central point, when rooms or floors were not in use.

The New York school buildings are used for many other activities besides class room work. The buildings are occupied for night school, community service and civic activities. Many of the larger buildings are partially in use from twelve to fifteen hours per day, while other parts of the building are occupied only from five to six hours per day. The heat needed to warm all of the rooms to 70 degrees was found to be a huge expense, unwarranted when compared to the time the rooms were occupied.

Excess Capacity of Heating Plants: Heating and ventilating plants for all classes of buildings are designed and equipped with the necessary boilers, radiators, fans, etc., to supply heat at 70 degrees during the coldest weather, night and day. The capacity of the modern heating system is 100 per cent larger than required for the average winter temperature. With temperature regulation, the heat supply is stored at the source, and a definite quantity is admitted to the room to control the temperature at 70 degrees. Where certain parts of a building are occupied only part of the day or night, the Heating System continues to dissipate the heat supply in the vacant rooms, when holding them at normal temperatures. These rooms should be shut off and temperatures maintained at lower points, from 40 to 50 degrees, or such temperatures as are determined to be economical.

In the New York city schools, various ideas of combining definite principles of pneumatically operating thermostats for securing additional heating economies were tried out. These ideas worked with sufficient success to assure the Board of Education that the fuel savings were large enough to pay for the additional costs of such equipment over the price of the regular Automatic Control System.

The new ideas of operation and the variation in demands made of modern Heating Plants led the Johnson Service Company to develop and patent the Dual Thermostat. In the application of the Dual Thermostat to a heating plant, heat may be controlled at two different temperatures in any room and all the different parts of a building may be cut off in groups or units of single rooms at will, without the necessity of installing separate steam supply mains with inaccessible valves involving excessive initial cost.



*Positive Dual Thermostat,
without push button.*

Invention The Dual Thermostat ranks with the leading inventions in the heating and ventilating and heat control industry. It is the greatest single contribution for the control and distribution of heat since the development of the Pneumatic Thermostat, by Warren S. Johnson. The addition of the Dual Thermostat to the Johnson System provides the necessary apparatus for delivering the heat and controlling the temperature in any part of a building to secure the necessary comfort, and the maximum saving in fuel.

Under Control of Engineer: With Dual Thermostats throughout the building under the control of a push button located in the Manager's or Engineer's office, the Johnson System of Temperature Regulation becomes the means of controlling some rooms at normal temperatures, and other rooms at low temperatures. By shutting off the heat in vacant rooms or rooms that are used for intermittent service, as we find in the modern school, college, auditorium or office building, the fuel savings will be enormous.

The Dual Thermostat and its application to present day heating and ventilating plants permits the handling of the heat supply in much the same manner as the electrical current that is used to light the building; when rooms are unoccupied, the lights are turned off; when heat is not needed, the Dual Thermostat operates at a lower temperature and conserves the fuel.

Function and Results: The function of the Dual Thermostat is economy in the use of fuel, and flexibility in the distribution of heat to various parts of a building or group of rooms, at the same time maintaining true temperature regulation. It supplies a long felt want desired by everyone interested in Heating Plants. Its use and application is readily apparent; the savings it will produce pay for its installation in a few years of operation.



Heights High School, Cleveland, O.

Franz C. Wagner and W. R. McCortuck, Architects. Wallace G. Nesbit, Director of Schools, B. of E. Mayer & Valentine, Consulting Engineers.

101 Dual Thermostats.

General Description of the Operation of Dual Thermostat

The Johnson Dual Thermostat is equipped with two bi-metal thermostatic elements, one for normal or day temperatures and the other for low or economy temperatures. Either of the thermal elements function to control temperature accurately and is brought into action by the air pressure in the piping system.

By the addition of a simple attachment to the standard Johnson Thermostat it is now possible, by momentarily decreasing the pressure in the air piping to about 7 pounds and restoring it to 15 pounds, to have either the normal temperature element or the low temperature element operate as preferred.

Controls Closely: The Dual Thermostat controls accurately on either thermal element and without variation in temperature noticeable to the individual. The change from normal or Day to low or Night temperatures is accomplished by a Push Button Switch that controls the air pressure rise and fall in an economical manner. Only the air pressure in the main is reduced; the storage supply of air is not changed but closed off while the push button automatically completes the change in the day or night control of the Dual Thermostat.

Dial and Key: Each Dual Thermostat is equipped with a concealed key dial to be used in setting the instrument to control temperatures constantly at about 70 degrees or to regulate intermittently at Day or Night temperatures. This dial is stamped with the words "Day" and "Dual". When the word "Day" appears before the opening in the thermostat front it will control only at normal temperatures. When the dial has been turned to show the word "Dual" it will control temperatures at about 70° for normal conditions, and 40° to 50° for off periods under the action of the central Push Button Switch.

Any of the Dual Thermostats in a building can be set to operate either at normal temperatures or Dual Temperatures and can be changed from time to time by means of the concealed key adjustment.

Push Button Attachment: In addition to the concealed key adjustment an exposed Button Switch has been arranged for the individual Dual Thermostat Cover. This button disengages the low temperature thermal element and secures temperature regulation on the high point or Day operation. The next time the Dual system is operated this instrument is back in step to control at either day or night conditions.



*Positive Dual Thermostat,
with push button.*

Made In All Types: The Johnson Dual Thermostat is made with positive, intermediate, and compound movements as desired.

The positive Dual Thermostat opens and closes Sylphon diaphragm valves on heat sources with snap action. This instrument eliminates wire drawing of valve seats and water hammer in radiators and pipes where steam circulation is improper. The Positive Dual Thermostat is equipped with an indicator showing whether the valve is "Open" or "Closed".

The Intermediate Dual Thermostat controls heat sources by means of sylphon diaphragm valves or dampers with true gradual motion. This thermostat allows just enough steam or water to flow into a radiator or warm air to enter a room to maintain even temperatures.

In the Compound Dual Thermostat the Johnson Service Company has provided both the positive and intermediate features. Compound Dual Thermostats have an extensive application where it is desired to control dampers with true gradual motion and diaphragm valves on direct radiation with positive action. This thermostat is used for blast systems of heating with mixing dampers and direct radiators, and for unit heaters where both the mixing damper in the cabinet and the direct radiator in the room are controlled.

The Johnson Dual Thermostat can be used in many different ways. The Johnson Service Company will furnish information on its application and use to engineers, owners and architects through its branch offices located in all principal cities.

The modern heating plant will not be complete without the Johnson Dual Thermostat. It meets all the demands for heating and the many contingencies of regulation that might be required for economy; it has been perfected and refined to provide the facilities of adjustment that will satisfy the most exacting demands of the user for office regulation; it is made of the same quality apparatus contained in all Johnson Thermostats, and it will withstand without injury the frequent changes from normal to Dual regulation that are imposed by its application to school-house or industrial regulation.

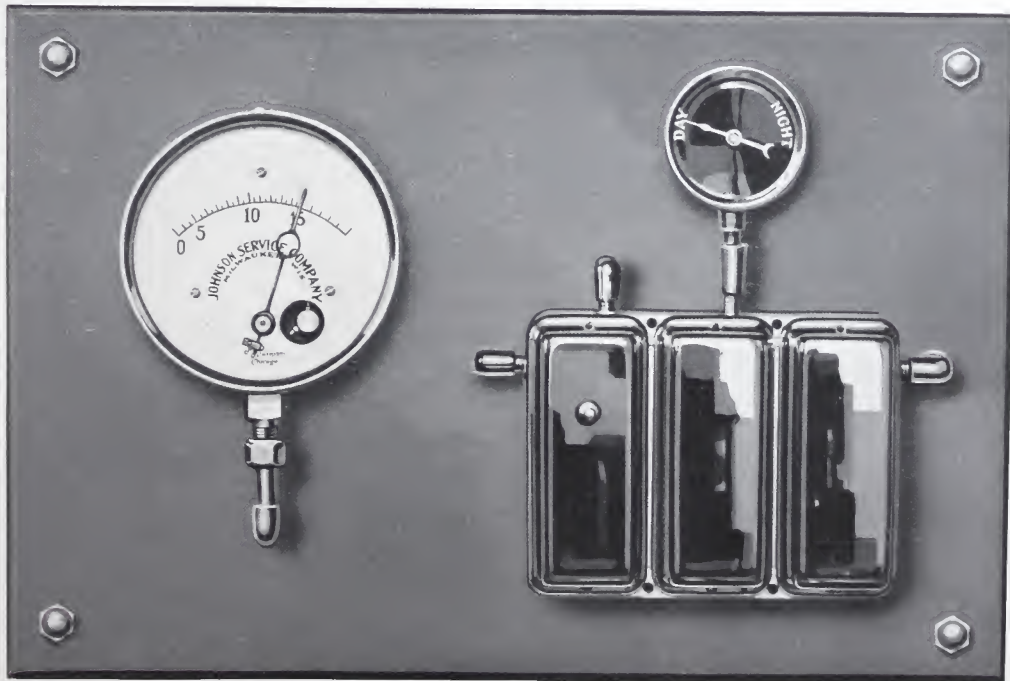
Operates at One Pressure: It is of particular importance to note that the Johnson Dual Thermostat with Push Button is a simple and effective device. The Dual Thermostat always operates at one pressure; it does not need reducing valves to change the control from Normal to Low temperatures. The pushing of the button on the switch is a momentary act accomplished without waste of time or unnecessary attention. The Dual Gauge always tells whether the thermostats are working at Normal temperatures or Dual temperatures. After pushing the switch the entire operation is automatic and accomplished by air-pressure.

No Distortion: The Johnson Dual Thermostat does not operate at high or low temperatures by distorting the bi-metal sensitive element through varying air pressure, which is entirely wrong, as the element is the most sensitive part of the Dual Thermostat and should always remain free to function in an undisturbed manner.

Piping System: The air piping system connecting the Dual Thermostats to valves, dampers, etc., to be controlled, is the same as would be installed for Johnson Positive and Intermediate Thermostats—and only a slight change in the thermostat connection is necessary to change from Single to Dual Thermostats.

Assembled Operation as Applied to a Complete Plant

The Dual Thermostat, like all Johnson Thermostats, is a temperature regulating instrument for automatically opening and closing radiator valves or dampers by means of compressed air power at 15 lbs. pressure. The Dual Thermostat is located on the wall of the room from which it is connected to the Air System Storage Tank, Push Button Switch, and Valves or Dampers by means of concealed compressed Air Piping. The air pressure in this system is maintained constantly at 15 lbs. by means of a small Air Compressor. From the Air Storage Tank, air piping delivers the compressed air throughout the building to all the Dual Thermostats, Valves, Dampers and other control devices attached to the heating units. The Push Button Switch, Air Gauge and Dual Gauge are located in the Engineer's office, Manager's office or on the central switch-board, as may be desired.



Push Button Switchboard.

Normal Temperature: Under normal operating conditions, the Dual Thermostat maintains the room temperature accurately at any desired normal degree; this is accomplished by opening and closing the valves or dampers attached to the heating units. Just enough steam is allowed to enter the radiator, or sufficient heat is delivered by the dampers to warm the room to the desired point of comfort.

Dual Temperatures: To secure the Dual or Economy temperatures for rooms that are not in use, the operating engineer or manager simply pushes the button on the Dual Switch and the air pressure operates the individual thermostats to control at such low temperatures determined to be economical by the owners or managers. To actuate the Dual Thermostats, the air pressure in the house main only is momentarily lowered to about 7 lbs. The pressure in the main is dropped by a simple automatic mechanism operated by the push button and is restored immediately to 15 lbs.

Operation Selective: Any of the Dual Thermostats can be set by means of a key dial to operate continuously at normal or 70 degree temperatures. Any number of the thermostats can be set to operate at Dual or Economy temperatures. The change from operating at normal temperatures only to operating at Dual temperatures or vice versa, is accomplished by inserting the key through the front of the thermostat and turning the dial to the word "Day" or to the word "Dual". These words appear back of a small opening in the thermostat front.

Push Button: The button on the Dual Thermostat Cover is a convenience applied generally to private offices. This button permits one to counteract the main switch and turn on the heat. The Dual Thermostat will then control at normal temperatures. Public places and class rooms should have the Dual Thermostat with only the concealed key adjustment.



*Intermediate Movement
Dual Thermostat.*

Many buildings have both intermittent heat service rooms as well as constant temperature rooms. For the normal temperature rooms, where heat is to be held at about 70 degrees throughout the entire day, the regular Johnson Positive or Intermediate Thermostat should be used.

Time Required: The change in a Dual Thermostat from normal to low temperature control or the reverse operation, in the average size building, takes about one-half minute of time. The operator only pushes the button and proceeds about his duties without waiting for the pressure to drop and rise again.

The Indexing of the central push button switch, allowing the air pressure to momentarily drop to 7 lbs. and rise again to the operating pressure, does not affect any of the Johnson Thermostats, working at normal temperatures. The constant temperature thermostats will continue to control accurately at 70 degrees unaffected by the Push Button operation.

Application to Buildings

The Johnson Dual Thermostat can be applied to any type of heating or ventilating plant. It is equally adaptable to steam, hot water, furnace blast, or a combination of these systems. We include a brief discussion of the general application of the Dual Thermostat to standard types of buildings.

There are always special problems arising in the office of every Engineer and Architect, for which the Dual Thermostat has a ready application, and solves the question of heat waste.

Schools and Colleges

The modern school and college building is provided with a group of class rooms, an office suite, a gymnasium, an auditorium, study rooms, a library and auxiliary rooms. Each room, or group of rooms, is occupied for varying periods of time, when the temperature should be maintained at about 70 degrees. When these rooms are not in use, the temperature should be lowered, for economy purposes, to 40 or 50 degrees. The Gymnasium and Auditorium, as well as the Board of Education Rooms, are frequently used at night. To warm these rooms the entire building must be heated.

With the Johnson Dual Thermostat the heat will be turned on to only those rooms requiring normal or 70 degree temperatures; all the other Thermostats will maintain the low temperature, for economy. During Saturdays, Sundays and holidays, the entire building can be regulated at the lower temperature. Just enough heat need be provided to protect the plumbing and fixtures from freezing.

Where new school additions are erected, attached to old buildings, the Johnson Dual Thermostat can be installed throughout both the old and new part. The instruments in the old building are exchanged for Dual Thermostats, and the entire plant can be equipped to save a maximum amount of coal.



*Girls' Commercial High School,
Brooklyn, N. Y.*

WILLIAM H. GOMPERT, Architect,
Superintendent of School Buildings.

Office Buildings

In the modern office building the Dual Thermostat provides a great source of saving. The temperature throughout the building can be lowered as soon as it is unoccupied. With the rise in outside temperatures, the heat that might be wasted by opening windows is conserved. The tenant requiring heat while working at night can actuate the Dual Thermostat in his room by pressing the button on the cover and this room will warm up to normal temperature. When office buildings are large, Dual Thermostats can be divided into groups. Each group can then be operated by a single Push Button Switch.

Theatres, Lodges and Auditoriums

Large halls, theatres and auditoriums present special problems for heating, ventilating and temperature regulation. Aside from the fuel savings obtained by using the Dual Thermostat there is a definite problem of temperature compensation required in the theatre. As the seats fill, the animal heat given off by the people raises the temperature. Dual Thermostats located in the heat supply ducts can be indexed from the Central Push Button to supply cooler air to hold the theatre or auditorium at comfortable temperatures.



*Theology Building, University of Chicago.
Coolidge & Hodgdon, Architects.*

Residences

The word "home" suggests to the busy man, whether he be rich or poor, a sense of restfulness and repose. There is not a normal man who does not possess an ambition to make his home as attractive, comfortable, and in every respect as liveable as his means will afford. There is probably nothing that gives the prospective home owner so much thought and so much bearing upon the comfort and health of the family as the question of how his home shall be heated and the temperature regulated. To solve this question, the Johnson Dual Thermostat, functioning at two different temperatures, permits the owner to regulate the rooms in his residence accurately and use the heat where it is needed.

The Dual Thermostat will keep the heating cost in the home at a minimum. This is one of the largest bills the home owner has to bear during the heating season. The Dual Thermostat, with its flexibility and accurate temperature regulation, works constantly to keep down the coal bill.

Churches and Cathedrals

The Church and Cathedral present a case where large volumes of heat are needed at definite times. For the greater part of the week the Auditorium, or Church proper, is empty, and the temperature should be maintained at a low point, sufficiently warm to protect the fixtures and decorations. By means of the Dual Thermostat, the auxiliary rooms in the Church or Cathedral can be warmed to normal temperatures, and the other parts of the building kept at a low temperature. The huge volume of heat required to warm the Church or Cathedral constantly to 70 degrees, or the necessary expense involved in running separate steam mains, represents a prohibitive cost, which is unnecessary when the Dual Thermostats are used.

Factory and Warehouse Buildings

With the expansion in manufacturing industries, expensive heating plants are required to keep the workers comfortable. Certain parts of factories and warehouses may be in use while other parts are idle and should be held at a low temperature. With the Dual Thermostat, operated by a Push Button, the Engineer or Manager can control and turn on the heat or hold certain parts of the building at low temperatures, from a central point. This scheme saves a great amount of steam or fuel, and keeps the heating bill to a minimum.

Where factory buildings are leased to a number of different tenants, the Dual Thermostat system can be arranged so that the heat may be turned on or off for an entire floor. Such parts of the floor as are vacant can be held at low temperatures, while the other parts can be warmed to normal temperatures. The switch for changing the Dual Thermostats to operate at normal or low temperatures is located in the Manager's office, or at some central point on the individual floor.

Old Buildings

Old buildings having a system of temperature regulation controlling at normal temperatures can be equipped with Dual Thermostats at a nominal cost. The old thermostats are replaced with the Dual instruments of the Positive, Graduated or Compound type. The air piping is not disturbed. The Push Button Switch is located on the main switchboard or in the Superintendent's or Manager's office. This change of thermostats from constant temperature to Dual instruments eliminates any expense for separate steam mains needed to cut off heat from unused parts of a building.

Specification for Dual Thermostats

The Thermostats shall be Johnson Model Dual Thermostats with positive (intermediate or compound) movement, capable of a two-temperature adjustment by means of a single switch operated at a central point in the building. Each Thermostat must be provided with a key device by which it is set to operate at one temperature constantly or at dual temperatures as desired, and a dial showing whether it is operating at dual or day temperature. All Thermostats must operate the valves or dampers at all times at a pressure of 15 pounds; must not depend for the two different temperatures on decreasing or increasing the pressure of the air in the mains, and must be guaranteed to operate to open and close the valves and dampers within a variation of one degree above or below the point at which they are set.

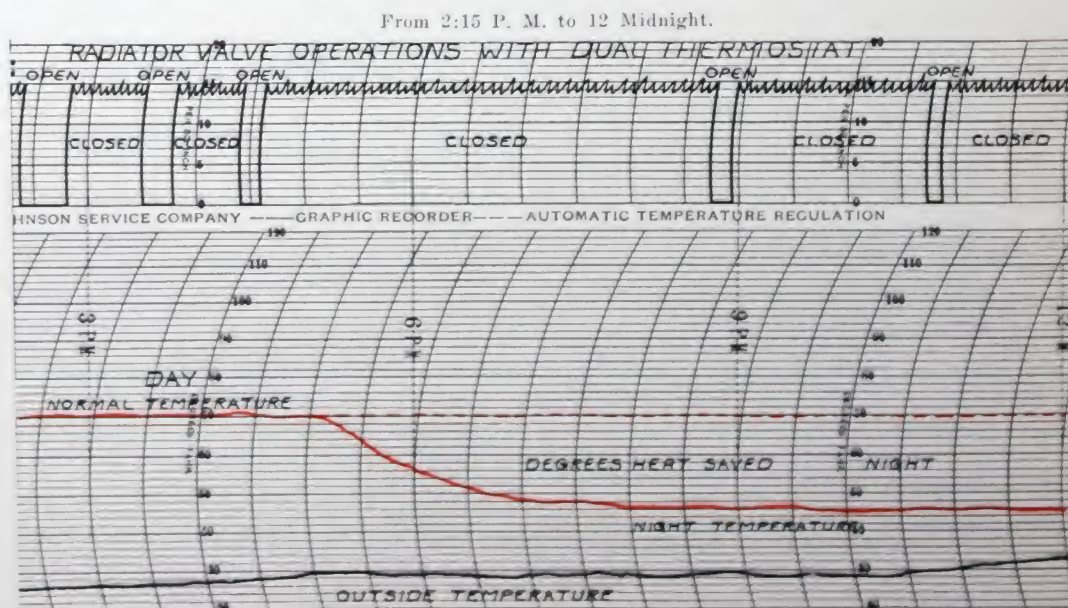
A slate board with push button and mechanism for automatically changing temperature adjustment from night to day and vice versa shall be located where directed. The board shall be provided with an air pressure gauge and a device indicating whether the Thermostats are operating at day or dual temperatures.

Results Obtained With Dual Temperature Regulation

1. The usual economy from the operation of the Temperature Regulation System, which creates a saving in the coal bill from 20 to 40 per cent, is obtained.
2. The Dual Thermostat creates an additional saving over the usual system of Temperature Regulation by turning off the heat and maintaining low temperatures in unoccupied rooms.
3. With the Dual System of Temperature Regulation there is a great saving in the construction of a heating and ventilating plant. Without the Dual System, it would be necessary to install separate steam mains to cut off the various parts of the building when they were not in use. This expensive method, requiring valves, piping, covering, excavation and labor for installation, as well as cost of maintenance, represents a tremendous investment. With the Dual Thermostat, separate steam mains are eliminated, and the Temperature Regulation, as well as the control of the various parts of the building, is combined in the Heat Control System.

Temperature and Pressure Record as Proof

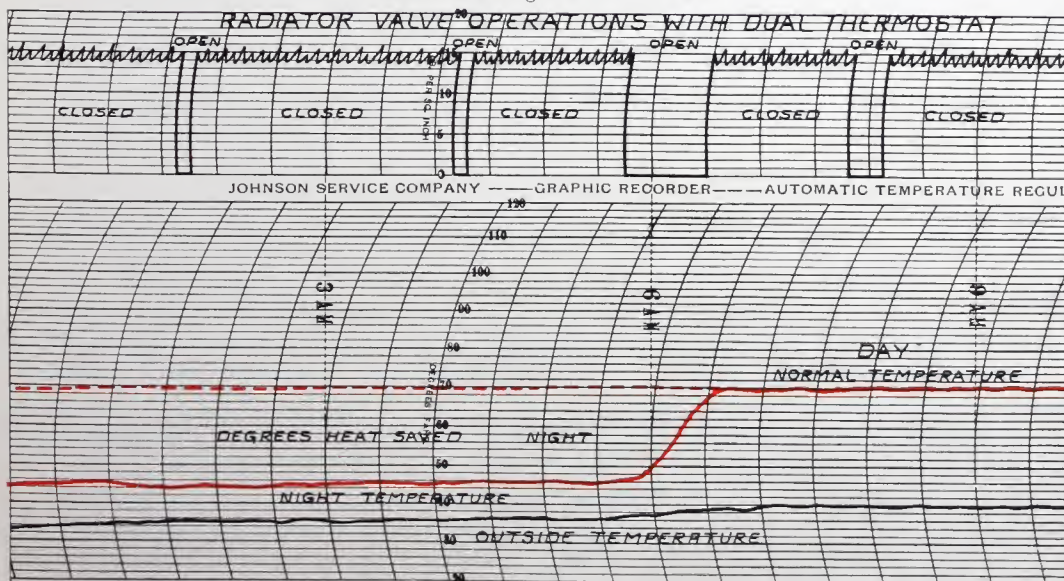
The chart running across the bottom of this and the opposite page is a graphic illustration of the economy effected by the use of the Dual Thermostat. It covers a period of time of from two o'clock one afternoon until ten-thirty the following forenoon, or, in other words, a portion of the day and all of the night. It shows the temperature maintained at 70° during the daytime and a temperature of 45° maintained during the night-time, and at the same time indicates the number of times the valve was opened and closed and the number of minutes steam was being used in the radiators during the period covered by the chart to maintain these temperatures. It will be noticed that both in the daytime and in the night-time the periods of time during which the valves were closed are long as compared with the periods of time during which the valves were open.



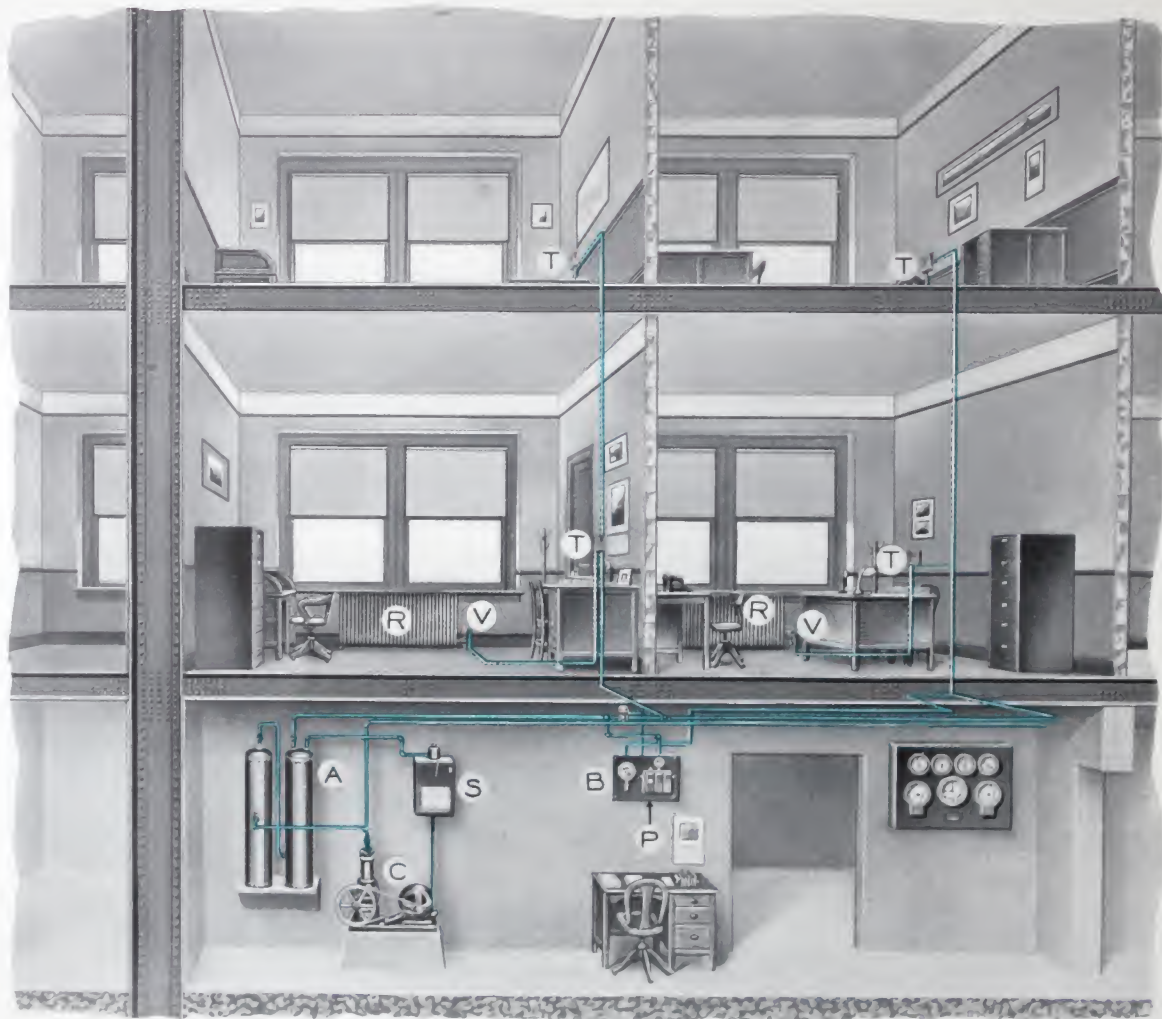
Explanation of Diagram

- The upper diagram shows periods of time during which the Syphon Diaphragm Valve on the radiator was opened and closed to maintain the temperatures indicated on the record. This is the pressure diagram and the jagged horizontal line at the top indicates that the air pressure of 15 pounds was on the valve and that the valve was consequently closed. When this jagged line drops down to the bottom of the top diagram it indicates that the air pressure has been exhausted from the valve and that the valve is open. It remains open until the line goes back again to the jagged horizontal line.
- The lower diagram shows the room temperature curve for day and night conditions. It is made by a recording thermometer. This line is in red ink. The black line at the bottom is the outside temperature for the time covered by the charts and has been traced on this chart in conformity with a line made by an outside recording thermometer.
- The night temperature mentioned between the hours of 5:10 P. M. and 6:40 A. M. was approximately 44° during the entire time and the saving in fuel is the difference between heating the building to 70° and heating it to 44° .
- The total length of time that the heat was turned on, from 5:10 P. M. to 6:40 A. M., was one hour and twenty minutes, or in other words, it required the use of steam in the radiators for one hour and twenty minutes, or 11% of the time, only, to maintain the temperature of the building at 44° .
- The total length of time heat was used in the radiators at daytime temperature (70°) was only one hour of the twelve hours of the total daytime shown on this chart. The proportion would probably have been the same for the remainder of the daytime. This indicates the daytime saving due to the use of the Johnson System of Automatic Temperature Regulation.

From 12 Midnight to 9:45 A. M.



Application of Dual System to Control of Direct Radiators in Office Building



Office buildings are ordinarily heated by direct radiators (R), distributed throughout the various rooms in the building.

Automatic Control with the Dual System is accomplished as follows: Air is compressed by Johnson Automatic Air Compressor (C) controlled by Johnson Automatic Governor Switch (S) into storage tanks (A) at a pressure of 15 pounds per square inch and distributed through galvanneal iron piping system (shown by blue lines in cut) to the various pneumatic devices.

Johnson Sylphon Radiator Valve (V) is opened and closed automatically by Johnson Dual Thermostat (T) on a variation of temperature of one degree at thermostat to maintain desired room temperature.

All Johnson Dual Thermostats (T) are adjusted simultaneously from the normal temperature to the dual or economy temperature at night time or other times when building is not occupied by pressing push button (P) on Dual Switchboard (B).

Where it is desired to restore the building to normal temperature, all Johnson Dual Thermostats are adjusted simultaneously from the economy temperature to the normal temperature by again pressing the push button (P).

If it is desired to restore any single room in the building to normal temperature, this may be accomplished by pressing push button located on Dual Thermostat in that room. The economy temperature is automatically restored on the next cycle of operation.

The arrangement of switchboard and piping is the same for schools and other buildings.

